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PATENT APPLICATION

ATTORNEY DOCKET NO. 200316414-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	**Winthrop D. Childers**	**Confirmation No.:**	**5591**
Application No.:	**10/782,706**	**Examiner:**	**LEWIS, David Lee**
Filing Date:	**February 18, 2004**	**Group Art Unit:**	**2629**

Title: Method and System for Reducing Gray Scale Discontinuities in Contrast Enhancing Screens Affected by Ambient Light

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on July 8, 2009.

☐ The fee for filing this Appeal Brief is $540.00 (37 CFR 41.20).

☒ No Additional Fee Required.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $130	☐ 2nd Month $490	☐ 3rd Month $1110	☐ 4th Month $1730

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 00. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

Respectfully submitted,

Winthrop D. Childers

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Patent Application of

Winthrop D. Childers

Application No. 10/782,706

Filed: February 18, 2004

For: Method and System for Reducing Gray Scale Discontinuities in Contrast Enhancing Screens Affected by Ambient Light

Group Art Unit: 2629

Examiner: LEWIS, David Lee

Confirmation No.: 5591

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
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P.O. Box 1450
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Sir:

In response to Appellants' filing of an Appeal Brief on 27 January 2009, the Examiner of this application reopened prosecution with a new final Office Action dated 14 May 2009 (the "final Office Action" or the "Action") (all references to the final Office Action herein will refer to the current and latest final Office Action of 14 May 2009, unless specifically noted otherwise). The final Office Action of 14 May rejects Appellant's claims on the ***same***

grounds as the previous final Office Action. No new grounds of rejection are raised. Rather, the Examiner merely attempts to better explain the same rejection made previously. Having reviewed the Examiner's new explanation, Appellants hereby request re-instatement of the appeal in this application and files the present, updated Appeal Brief, along with a new Notice of Appeal, in support of the re-instated appeal.

I. Real Party in Interest

The real party in interest is Hewlett-Packard Development Company, LP, a limited partnership established under the laws of the State of Texas and having a principal place of business at 20555 S.H. 249 Houston, TX 77070, U.S.A. (hereinafter "HPDC"). HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware Corporation, headquartered in Palo Alto, CA. The general or managing partner of HPDC is HPQ Holdings, LLC.

II. Related Appeals and Interferences

There are no appeals or interferences related to the present application of which the Appellant is aware.

III. Status of Claims

Claims 1-46 are pending in the application and stand finally rejected. Accordingly, Appellant appeals from the final rejection of claims 1-46, which claims are presented in the Appendix.

IV. Status of Amendments

No amendments have been filed subsequent to the final Office Action of September 9, 2008 or the final Office Action of May 14, 2009, from which Appellant takes this appeal.

V. Summary of Claimed Subject Matter

Claim 1 recites:

A method of reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said method comprising:

measuring (193) an intensity of said ambient light (*Appellant's specification, paragraph 0052*);

comparing (194) said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region (*Appellant's specification, paragraph 0052*); and

generating (196) apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison (*Appellant's specification, paragraph 0057*).

Claim 7 recites:

A method of operating a light engine configured to project light onto a group of pixel locations of a viewing surface during a time period, said method comprising:

estimating an ambient light energy received by said group of pixel locations during said time period (*Appellant's specification, paragraphs 0023 and 0024*);

determining a threshold gray scale level of the light engine (*Appellant's specification, paragraph 0039*); and

dithering pixels having gray scale levels at or below said threshold gray scale level to be displayed in said group of pixel locations if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level (*Appellant's specification, paragraph 0057*).

Claim 12 recites:

A method of operating a light engine configured to generate and display an image on a viewing surface, said image formed by pixels having varying gray scale levels, said method comprising:

generating an estimate of an ambient light intensity level (*Appellant's specification, paragraphs 0023 and 24*); and

selecting between half-toning and dithering to generate said gray scale levels for each of said pixels in response to said estimated ambient light level (*Appellant's specification, paragraphs 0039 and 0051*).

Claim 17 recites:

A system for reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said system comprising:

an ambient light sensor (107) configured to measure an intensity of said ambient light (*Appellant's specification, paragraph 0032*);

an image processing unit (106) configured to compare said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region (*Appellant's specification, paragraph 0053*); and

a spatial light modulator (103) configured to generate apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison (*Appellant's specification, paragraph 0039*).

Claim 23 recites:

A light engine for displaying an image having a gradual shading region on a contrast enhancing screen, said light engine comprising:

a spatial light modulator (103) configured to generate gray scale levels for pixels in said image (*Appellant's specification, paragraph 0039*);

projector optics (104) configured to project light comprising said image onto said contrast enhancing screen (105) (*Appellant's specification, paragraph 0030*), said projected light having an intensity; and

an ambient light sensor (107) configured to measure an intensity of ambient light reflecting off pixel locations in said contrast enhancing screen (105) corresponding to said gradual shading region (*Appellant's specification, paragraph 0032*);

wherein said spatial light modulator (103) reduces a gray scale discontinuity caused by said ambient light between pixel locations in a blackened state on said contrast enhancing screen (105) and said pixel locations in said gradual shading region by generating apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region based on a comparison between said measured ambient light intensity and said projected light intensity (*Appellant's specification, paragraph 0039*).

Claim 28 recites:

A projector system for displaying an image on a viewing surface, said system comprising:

a light engine (100) configured to generate pixels having gray scale levels to be displayed in corresponding pixel locations on said viewing surface (105) (*Appellant's specification, paragraph 0027*); and

an ambient light sensor (107) configured to measure an intensity of ambient light reflecting off said pixel locations on said viewing surface (105) (*Appellant's specification, paragraph 0032*);

wherein said light engine (100) is further configured to receive said measured ambient light intensity from said ambient light sensor (107) and select between a half-toning algorithm and a dithering algorithm to generate said gray scale levels for each of said pixels based on said measured ambient light intensity (*Appellant's specification, paragraphs 0039 and 0051*).

Claim 36 recites:

A system for reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said system comprising:

means (107) for measuring an intensity of said ambient light (*Appellant's specification, paragraph 0032*);

means (106) for comparing said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region (*Appellant's specification, paragraph 0053*); and

means (103) for generating apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison (*Appellant's specification, paragraph 0039*).

Claim 40 recites:

A system for operating a light engine configured to project light onto a group of pixel locations of a viewing surface during a time period, said system comprising:

means (107) for estimating an ambient light energy received by said group of pixel locations during said time period (*Appellant's specification, paragraphs 0023 and 0024*);

means (106) for determining a threshold gray scale level of said light engine (*Appellant's specification, paragraphs 0039*); and

means (106, 103) for dithering pixels having gray scale levels at or below said threshold gray scale level to be displayed in said group of pixel locations if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level (*Appellant's specification, paragraphs 0057*).

Claim 42:

A system for operating a light engine configured to generate and display an image on a viewing surface, said image formed by pixels having varying gray scale levels, said system comprising:

means (107, 106) for generating an estimate of an ambient light intensity level (*Appellant's specification, paragraphs 0023 and 24*); and

means (106) for selecting between a half-toning means and a dithering means to generate said gray scale levels for each of said pixels in response to said estimated ambient light level (*Appellant's specification, paragraphs 0039 and 0051*).

VI. Grounds of Rejection to be Reviewed on Appeal

The current final Office Action of May 14, 2009 raised only a single ground of rejection.

Claims 1-46 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,853,486 to Cruz-Uribe et al ("Cruz")

According, Appellant hereby requests review of this rejection in the present appeal.

VII. Argument

(1) Claims 1-46 are patentable over Cruz:

The current final Office Action, like the previous final Office Action before it, addresses Appellant's claims by restating what each claim recites and providing references to specific portions of Cruz where that element is allegedly anticipated. The Action generally does not, however, give any explanation as to how the cited portions of Cruz are understood or construed relative to the claimed subject matter.

As Appellant has studied the current Action and Cruz, Appellant finds, time after time, that the cited portions of Cruz have little or no relevance to the claimed subject matter indicated. Consequently, the current Action clearly fails to establish anything approaching a *prima facie* case of anticipation with regard to *any* of Appellant's claims. Appellant will demonstrate these failings of the current Action with specific examples below.

Claim 1:

Claim 1 recites:

> A method of reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said method comprising:
>
> measuring an intensity of said ambient light;
>
> comparing said measured ambient light intensity *to an average intensity of light projected by said projector* <u>*onto said gradual shading region*</u>; and
>
> generating apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison.

(Emphasis added).

Applicant here notes that claim 1 is a method that calls for measuring an intensity of ambient light and comparing the measured ambient light intensity to an average intensity of light projected by a projector "*onto said gradual shading region*." (Claim 1). Thus, the

comparison is not between the ambient light intensity and the average intensity of *all* projected light, but rather between the ambient light intensity and the average intensity of light projected onto a specific "gradual shading region." The cited prior art fails to teach or suggest this subject matter. The current final Office Action makes no attempt to identify this subject matter within the cited prior art reference.

A "gradual shading region" is defined and explained in Applicant's specification at, for example, paragraph 0048. As explained there, a "gradual shading region" is a region of the displayed image where there is a transition between two different colors. This definition is consistent with the use of this term in the art and with what would be understood by one of skill in the art reading Appellant's specification.

Appellant here notes the well-established rule that the inventor may be his or her own lexicographer. *Lear Siegler, Inc. v. Aeroquip Corp.*, 733 F.2d 881, 888-89, 221 U.S.P.Q. 1025 (Fed. Cir. 1984). According to the MPEP, "[a] fundamental principle contained in 35 U.S.C. 112, second paragraph is that applicants are their own lexicographers." (MPEP §2173.01). Consequently, where an applicant defines a term in the specification, that definition must be respected when construing the claims. *Markman v. Westview Instruments*, 116 S. Ct. 1384 (1996); *McGill, Inc. v. John Zink Co.*, 736 F.2d 666, 674 (Fed. Cir. 1984); *ZMI Corp. v. Cardiac Resuscitator Corp.* 884 F.2d 1576, 1580, 6 U.S.P.Q.2d 1557, 1560-61 (Fed. Cir. 1988) ("words must be used in the same way in both the claims and the specification.").

With regard to the claimed method step of "comparing said measured ambient light intensity *to an average intensity of light projected by said projector* <u>*onto said gradual shading region*</u>," the current final Office Action alleges that Cruz teaches this subject matter as follows. According to the Action, Cruz teaches

> comparing said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region, column 5 lines 4-7 & 48-55, column 6 lines 40-58; wherein the current from the photo-detector 38 may be averaged and is compared to a pre-set threshold or intensity level, wherein a threshold current value is used to distinguish the averaged ambient light from the averaged projected light, wherein for example because the threshold current is above the ambient light value, areas of the screen that contain only ambient light, can remain dark, having a quality contrast.

(Action, p. 4).

Appellant notes that this argument does not even attempt to address what is actually claimed. Nowhere does this argument explain how Cruz teaches identifying the average intensity of light projected onto a specific gradual shading region and comparing that average to the measured ambient light intensity as claimed. Consequently, the Action clearly fails to make out a *prima facie* case of anticipation with regard to claim1.

As noted above, the Action cited to three specific portions of Cruz in columns 5 and 6. These portions of the reference read as follows.

> The control image may be generally representative of the intensity distribution of the visible image. In particular, the control image may be an infrared image that is projected by the light engine of the projector.

(Cruz, col. 5, lines 4-7).

There is no discussion here of identifying a specific gradual shading region or of ascertaining the average intensity of light projected by a projector onto such a region. Consequently, there can be no teaching of comparing such a value to an ambient light intensity as claimed.

> In another embodiment, the pixel element capacitor and integration capacitor may be exchanged, eliminating the issue of charge sharing between the two capacitors. Alternatively, the circuit may be unsynchronized. That is, the current from the photodetector may be averaged, and the pixel element activated according to a preset threshold value. This circuit may represent a simpler configuration for the spatially addressed distributed electrode controller.

(Cruz, col. 5, lines 48-55).

Again, there is no discussion here of identifying a specific gradual shading region or of ascertaining the average intensity of light projected by a projector onto such a region.

Consequently, there can be no teaching of comparing such a value to an ambient light intensity as claimed.

> Photodetector 38 may be responsive to visible light. The control image may be the projected image itself, provided that the projection screen is configured to change the reflectance state of the active layer only when the intensity of the light of the incident control image reaches a pre-determined intensity level. This pre-set intensity level may be above the ambient light level in the wavelengths used, assuring that in the regions of the display surface where only ambient light is incident on the screen, the screen will remain dark, thereby improving the contrast of the image. Optionally, a potentiometer or other adjusting mechanism may be provided to adjust the threshold light level at which the pixel elements change reflectance state, so that the screen can provide good contrast under a range of ambient light conditions. The adjusting mechanism may be manual, or alternatively, an automatic adjusting mechanism may be provided, such as an electronic circuit having a light sensor, for example.

(Cruz, col. 6, lines 40-58).

Again, there is no discussion here of identifying a specific gradual shading region or of ascertaining the average intensity of light projected by a projector onto such a region. Consequently, there can be no teaching of comparing such a value to an ambient light intensity as claimed.

It is incumbent upon the Examiner to identify where in the reference each element may be found. *Ex parte Levy*, 17 U.S.P.Q.2d 1461 (BPAI 1990). Clearly, the Examiner has failed to carry this burden in the present case. There is no explanation of record that supports the conclusion that Cruz anticipates the subject matter of claim 1. To the contrary, Cruz does not appear to teach or suggest the claimed method including "comparing said measured ambient light intensity *to an average intensity of light projected by said projector* <u>*onto said gradual shading region*</u>; and generating apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison." (Emphasis added). Moreover, the final Office Action is unable to actually identify any such subject matter in the teachings of the cited prior art.

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 1 and its dependent claims should not be sustained.

Claim 7:

Claim 7 recites:

> A method of operating a light engine configured to project light onto a group of pixel locations of a viewing surface during a time period, said method comprising:
> estimating an ambient light energy received by said group of pixel locations during said time period;
> determining a threshold gray scale level of the light engine; and
> *dithering pixels having gray scale levels at or below said threshold gray scale level to be displayed in said group of pixel locations if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level.*

(Emphasis added).

Appellant notes that the method of claim 7 only recites dithering pixels "if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level." Moreover, if dithering occurs, claim 7 does not recite dithering *all* pixels, but rather recites "dithering pixels *having gray scale levels at or below said threshold gray scale*." (Emphasis added).

In this regard, the Office Action cites three different portions of the Cruz reference. (Action, p. 6). Unfortunately, the Action provides absolutely no explanation as to how the cited portions of Cruz are relevant to the subject matter of claim 7. This is a recurring deficiency in the Office Action.

Turning to the portions of Cruz cited in the Action, the first, col. 3, lines 45-60, has nothing to do with dithering. The third, col. 6, lines 40-57, was quoted above and, likewise,

does not mention dithering. The second section of Cruz cited, col. 4, lines 10-22, states the following.

> *The image data for a full color image may be converted by the reflectance processor into an approximately grayscale image by dithering the image using black and white pixels, where the black and white pixels may then be mapped to the high reflectance and low reflectance states of the pixel elements of the display surface*. The resulting gray-scale image may then enhance the contrast of the image projected onto the display surface. Alternatively, the desired image may include gray tones created by rapidly switching selected pixel elements between the high reflectance and low reflectance states, so that the pixel elements are perceived by the viewer as an intermediate reflectance state.

(Cruz, col. 4, lines 10-22) (emphasis added).

Thus, Cruz teaches dithering to convert an entire full color image into a grayscale image. Cruz does not appear to teach dithering specific pixels "having gray scale levels at or below said threshold gray scale level to be displayed in said group of pixel locations *if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level*," as recited in claim 7. (Emphasis added). Again, the Action fails to provide enough analysis to make out a *prima facie* case of anticipation with respect to claim 7. *Ex parte Levy*, 17 U.S.P.Q.2d 1461 (BPAI 1990).

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 7 and its dependent claims should not be sustained.

Claim 12:

Independent claim 12 recites:

> A method of operating a light engine configured to generate and display an image on a viewing surface, said image formed by pixels having varying gray scale levels, said method comprising:
> generating an estimate of an ambient light intensity level; and
> *selecting between half-toning and dithering to generate said gray scale levels for each of said pixels in response to said estimated ambient light level.*

(Emphasis added).

In this regard, the Office Action cites to Cruz at col. 2, lines 55-67; col. 3, lines 45-55, col. 4, lines 10-25 and col. 6, lines 40-58. (Action, p. 8). Beyond giving these spot cites, the final Office Action provides no explanation whatsoever as to how Cruz teaches or suggests the claimed subject matter.

Appellant has reviewed the cited portions of Cruz and finds them irrelevant to the subject matter claimed. The cited portions of Cruz read as follows.

> A projection screen may incorporate a plurality of display elements, each display element including at least one active pixel element. One or more optical properties of each pixel element may be individually modified, so that the projection screen may exhibit the desired variable reflectivity (in the case of front projection) or variable transmissivity (in the case of rear projection). As shown in FIG. 2, front projection screen 14 incorporates a plurality of display elements 22, each display element including at least one active pixel element 24. The reflectivity of each pixel element 24 may be individually modified. Each display element may include a single pixel element, or a plurality of pixel elements, and may include a bias region 26. The bias region may occupy a portion of the perimeter of the display element, may occupy one edge of the display element, or may be placed within the active pixel region of the display element. The reflectivity of the bias region may be fixed at the time of projection screen manufacture, or may be adjusted to one or more constant values.

(Cruz, col. 2, line 54- col. 3, line 5).

There is no teaching or suggestion here of "*selecting between half-toning and dithering to generate said gray scale levels for each of said pixels in response to said estimated ambient light level.*" (Claim 12) (emphasis added). There is no mention of either half-toning or dithering, let alone criteria for selecting one or the other for specific pixels.

> As shown schematically in FIG. 3, display system 10 may include a display controller 28 configured to alter the reflectivity of display surface 14 in coordination with the image displayed thereon, by selectively altering the reflectivity of individual display elements 22 to correspond with the content of the projected image incident upon that individual pixel element. Any device or mechanism capable of modulating the reflectivity of the pixel elements in the display surface in order to achieve coordination with the projected image is a suitable display controller.

(Cruz, col. 3, lines 45-55).

Again, there is no teaching or suggestion here of "*selecting between half-toning and dithering to generate said gray scale levels for each of said pixels in response to said estimated ambient light level.*" (Claim 12) (emphasis added). There is no mention of either half-toning or dithering, let alone criteria for selecting one or the other for specific pixels.

> The image data for a full color image may be converted by the reflectance processor into an approximately grayscale image by dithering the image using black and white pixels, where the black and white pixels may then be mapped to the high reflectance and low reflectance states of the pixel elements of the display surface. The resulting gray-scale image may then enhance the contrast of the image projected onto the display surface. Alternatively, the desired image may include gray tones created by rapidly switching selected pixel elements between the high reflectance and low reflectance states, so that the pixel elements are perceived by the viewer as an intermediate reflectance state.
>
> Rather than simply mapping to a gray scale image, the conversion of the image data to reflectance data may involve a more sophisticated data conversion.

(Cruz, col. 4, lines 10-25)

Again, there is no teaching or suggestion here of "*selecting between half-toning and dithering to generate said gray scale levels for each of said pixels in response to said estimated ambient light level.*" (Claim 12) (emphasis added). There is no mention of either half-toning or dithering, let alone criteria for selecting one or the other for specific pixels.

> Photodetector 38 may be responsive to visible light. The control image may be the projected image itself, provided that the projection screen is configured to change the reflectance state of the active layer only when the intensity of the light of the incident control image reaches a pre-determined intensity level. This pre-set intensity level may be above the ambient light level in the wavelengths used, assuring that in the regions of the display surface where only ambient light is incident on the screen, the screen will remain dark, thereby improving the contrast of the image. Optionally, a potentiometer or other adjusting mechanism may be provided to adjust the threshold light level at which the pixel elements change reflectance state, so that the screen can

> provide good contrast under a range of ambient light conditions. The adjusting mechanism may be manual, or alternatively, an automatic adjusting mechanism may be provided, such as an electronic circuit having a light sensor, for example.

(Cruz, col. 6, lines 40-58).

Again, there is no teaching or suggestion here of "*selecting between half-toning and dithering to generate said gray scale levels for each of said pixels in response to said estimated ambient light level*." (Claim 12) (emphasis added). There is no mention of either half-toning or dithering, let alone criteria for selecting one or the other for specific pixels.

It is incumbent upon the Examiner to identify where in the reference each element may be found. *Ex parte Levy*, 17 U.S.P.Q.2d 1461 (BPAI 1990). Consequently, when the Examiner fails to identify a claimed element, the Examiner has failed to establish a *prima facie* case of anticipation.

In the present case, the Examiner has clearly failed to make out a *prima facie* case of anticipation. Moreover, Cruz, as cited in the Action, clearly does not teach or suggest a method including "*selecting between half-toning and dithering to generate said gray scale levels for each of said pixels in response to said estimated ambient light level*." (Claim 12) (emphasis added).

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 12 and its dependent claims should not be sustained.

Claim 17:

Independent claim 17 recites:

> A system for reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said system comprising:
>
> an ambient light sensor configured to measure an intensity of said ambient light;
>
> an image processing unit configured to *compare said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region*; and
>
> a spatial light modulator configured to generate apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison.

(Emphasis added).

Claim 17 is similar to claim 1, discussed above, in that claim 17 recites a system that measures an intensity of ambient light and compares the measured ambient light intensity to an average intensity of light projected by a projector "*onto said gradual shading region*." (Claim 17). Thus, the processing unit is not making a comparison between the ambient light intensity and the average intensity of all projected light, but rather between the ambient light intensity and the average intensity of light projected onto a specific "gradual shading region." As noted above, "gradual shading region" is defined and explained in Applicant's specification at, for example, paragraph 0048.

The current Office Action simply cites to Cruz at Fig. 3, item 28 for a teaching of the claimed image processing unit. (Action, p. 9). With regard to this item, Cruz teaches the following. "As shown schematically in FIG. 3, display system 10 may include a display controller 28 configured to alter the reflectivity of display surface 14 in coordination with the image displayed thereon, by selectively altering the reflectivity of individual display elements 22 to correspond with the content of the projected image incident upon that individual pixel

element." (Cruz, col. 3, lines 46-52). Clearly, there is no teaching or suggestion here of the claimed processing unit "configured to *compare said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region*." (Claim 17).

Continuing the current Office Action cites generally the same portions of Cruz that have been addressed and quoted above. (Action, p. 10). None of those sections teach or suggest the claimed processing unit "configured to *compare said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region*." (Claim 17) (emphasis added). None of those sections teach or suggest the claimed "spatial light modulator configured to generate apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region *based on said comparison*." (Claim 17) (emphasis added).

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 17 and its dependent claims should not be sustained.

Claim 23:

Claim 23 recites:

> A light engine for displaying an image having a gradual shading region on a contrast enhancing screen, said light engine comprising:
> a spatial light modulator configured to generate gray scale levels for pixels in said image;
> projector optics configured to project light comprising said image onto said contrast enhancing screen, said projected light having an intensity; and

> *an ambient light sensor configured to measure an intensity of ambient light reflecting off pixel locations in said contrast enhancing screen corresponding to said gradual shading region*;
>
> wherein said spatial light modulator reduces a gray scale discontinuity caused by said ambient light between pixel locations in a blackened state on said contrast enhancing screen and said pixel locations in said gradual shading region by *generating apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region based on a comparison between said measured ambient light intensity and said projected light intensity.*

(Emphasis added).

Similar to the discussion above, the Office Action has failed to accurately indicate how or where Cruz teaches the claimed "ambient light sensor configured to measure intensity of ambient light reflecting off pixel locations" of a screen specifically corresponding to a "gradual shading region;" or the claimed spatial light modulator that generates "apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region based on a comparison between said measured ambient light intensity and said projected light intensity." (Action, p. 12).

With regard to the claimed ambient light sensor, the Action cited to Cruz at col. 5, lines 20-40; col. 6, lines 40-57 and col. 12, lines 39-51. These portions of Cruz read as follows.

> As shown in FIG. 4, the photodetector may be incorporated in the bias region 26 of the display element.
>
> Also as shown in FIG. 4, bias area 26 may include circuitry capable of controlling the reflectivity of the associated pixel element in response to illumination of that display pixel. This circuitry may include one or more photodetectors 38 (such as a photodiode or other photosensitive element) that may be connected to an amplifier 39. Amplifier 39 may amplify the charge or the current controlled by the photodetector. Amplifier 39 may be connected to one or more capacitors. The capacitors may be used to integrate the current controlled by the photodetector (or amplifier 39), while an additional circuit may switch between two integration capacitors. The first integration capacitor 40 may integrate photodetector current, while the second integration capacitor 41 may determine the bias to be applied to pixel element 24 (that is, determine the reflectance state to be exhibited by that pixel element in order to coordinate with the projected image). Alternatively, or in addition,

> the current from the photodetector may be compared to a reference current to determine illumination of the photodetector by the control image.

(Cruz, col. 5, lines 20-40).

There is no teaching or suggestion here of the claimed "ambient light sensor configured to measure an intensity of ambient light reflecting off pixel locations in said contrast enhancing screen *corresponding to said gradual shading region*." (Claim 23) (emphasis added).

> Photodetector 38 may be responsive to visible light. The control image may be the projected image itself, provided that the projection screen is configured to change the reflectance state of the active layer only when the intensity of the light of the incident control image reaches a pre-determined intensity level. This pre-set intensity level may be above the ambient light level in the wavelengths used, assuring that in the regions of the display surface where only ambient light is incident on the screen, the screen will remain dark, thereby improving the contrast of the image. Optionally, a potentiometer or other adjusting mechanism may be provided to adjust the threshold light level at which the pixel elements change reflectance state, so that the screen can provide good contrast under a range of ambient light conditions. The adjusting mechanism may be manual, or alternatively, an automatic adjusting mechanism may be provided, such as an electronic circuit having a light sensor, for example.

(Cruz, col. 6, lines 40-58).

There is no teaching or suggestion here of the claimed "ambient light sensor configured to measure an intensity of ambient light reflecting off pixel locations in said contrast enhancing screen *corresponding to said gradual shading region*." (Claim 23) (emphasis added).

> In one embodiment of the projection screen, the pixel elements may be switched between a high-reflectance state, typically white, to a low-reflectance state, typically black. With appropriate pixilation, an array of black and white pixel elements may be used to create gray scale shading. Alternatively, the display surface may include a plurality of colored pixel elements including, but not limited to, red pixel elements, green pixel elements, blue pixel elements, yellow pixel elements, white pixel elements, etc. Each pixel element may display the selected color either by displaying all or part of pigmented particles, or in the case of electrophoretic pixel elements, by revealing the rear surface of the electrophoretic display cell.

(Cruz, col. 12, lines 39-51).

There is no teaching or suggestion here of the claimed "ambient light sensor configured to measure an intensity of ambient light reflecting off pixel locations in said contrast enhancing screen *corresponding to said gradual shading region*." (Claim 23) (emphasis added). For at

least this reason, the Action fails to make out a *prima facie* case of unpatentability as to claim 23.

Additionally, with regard to the claimed spatial light modulator, Applicant notes that "the term 'apparent gray scale level' will be used to refer to an average intensity of all the pixels within a pixel block (e.g.; 150-153). The average intensity of the pixels may be calculated across a number of frames, depending on the dithering algorithm." (Applicant's specification, paragraph 0062). In this regard, as in the treatment of previous claims, the Action indiscriminately cites half-a-dozen portions of Cruz *without explaining the relevance of any of them.* (Action, p. 12).

As with previous claims, Appellant could reproduce each of the citations from p. 12 of the final Office Action regarding the claimed spatial light modulator and *none* of those sections would actually teach or suggest the claimed modulator that "generat[es] apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region based on a comparison between said measured ambient light intensity and said projected light intensity." (Claim 23). For at least this additional reason, the Action fails to make out a *prima facie* case of unpatentability as to claim 23.

It is incumbent upon the Examiner to identify where in the reference each element may be found. *Ex parte Levy*, 17 U.S.P.Q.2d 1461 (BPAI 1990). Consequently, when the Examiner fails to identify a claimed element, the Examiner has failed to establish a *prima facie* case of anticipation.

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed.

Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 23 and its dependent claims should not be sustained.

Claim 28:

Claim 28 recites:

> A projector system for displaying an image on a viewing surface, said system comprising:
> a light engine configured to generate pixels having gray scale levels to be displayed in corresponding pixel locations on said viewing surface; and
> an ambient light sensor configured to measure an intensity of ambient light reflecting off said pixel locations on said viewing surface;
> wherein said light engine is further configured to receive said measured ambient light intensity from said ambient light sensor and *select between a half-toning algorithm and a dithering algorithm to generate said gray scale levels for each of said pixels based on said measured ambient light intensity.*

(Emphasis added).

Similar to the rejection of claim 12, treated above, the Office Action cites to Cruz at col. 3, lines 45-60, col. 4, lines 1-35, col. 5, lines 20-40 and col. 6, lines 40-57 in rejected in claim 28. (Action, p. 14). Again, Applicant has reviewed these portions of Cruz. However, Cruz, as cited, does not appear to teach a system that includes a light engine configured to "select between a half-toning algorithm and a dithering algorithm to generate" gray scale levels for individual pixels in response to a measured ambient light level. In fact, the Office Action fails to indicate how or where Cruz even mentions half-toning.

Again, the Action fails to make out a *prima facie* case of anticipation against claim 28. "A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 28 and its dependent claims should not be sustained.

Claim 36:

Claim 36 recites:

> A system for reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said system comprising:
> means for measuring an intensity of said ambient light;
> means for comparing said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region; and
> means for generating apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison.

In contrast, as discussed above, the Action has failed to demonstrate how or where Cruz teaches means for comparing measured ambient light intensity to an average intensity of light projected by said projector onto a specific "gradual shading region," as recited by claim 36. The Action has further failed to demonstrated how or where Cruz teaches means for "generating apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region *based on said comparison*." The Action does not even address the concept of an apparent gray scale level as defined in Applicant's specification, let alone the recited comparison.

As with previous claims, the Action, in rejecting claim 36, merely cited various portions of Cruz discussed previously which are, in fact, inapplicable to the claimed subject matter. Again, it is incumbent upon the Examiner to identify where in the reference each element may be found. *Ex parte Levy*, 17 U.S.P.Q.2d 1461 (BPAI 1990). Consequently, when the Examiner fails to identify a claimed element, the Examiner has failed to establish a *prima facie* case of anticipation.

Moreover, "[a] claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single

prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 36 and its dependent claims should not be sustained.

Claim 40:

Claim 40 recites:

> A system for operating a light engine configured to project light onto a group of pixel locations of a viewing surface during a time period, said system comprising:
> means for estimating an ambient light energy received by said group of pixel locations during said time period;
> means for determining a threshold gray scale level of said light engine; and
> means for dithering pixels having gray scale levels at or below said threshold gray scale level to be displayed in said group of pixel locations if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level.

As with claim 7, discussed above, Applicant notes that the system of claim 40 only includes means for "dithering pixels … if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level." Moreover, claim 40 does not recite means for dithering *all* pixels indiscriminately, but rather recites "means for dithering pixels *having gray scale levels at or below said threshold gray scale*." (Emphasis added).

As with claim 7 above, the Office Action cites several different portions of the Cruz reference. (Action, p. 17). However, the Action does not contain *any* explanation of the relevance of any of the cited portions of Cruz.

Applicant has reviewed the cited portions and finds that only the same one cited above in regard to claim 7 even mentions dithering.

> *The image data for a full color image may be converted by the reflectance processor into an approximately grayscale image by dithering the image using black and white pixels, where the black and white pixels may then be mapped to the high*

> *reflectance and low reflectance states of the pixel elements of the display surface*. The resulting gray-scale image may then enhance the contrast of the image projected onto the display surface. Alternatively, the desired image may include gray tones created by rapidly switching selected pixel elements between the high reflectance and low reflectance states, so that the pixel elements are perceived by the viewer as an intermediate reflectance state.

(Cruz, col. 4, lines 10-22) (emphasis added).

Thus, as noted above, Cruz teaches dithering to convert an entire full color image into a grayscale image. Cruz does not appear to teach means for dithering specific pixels "having gray scale levels at or below said threshold gray scale level to be displayed in said group of pixel locations *if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level*," as recited in claim 40. (Emphasis added).

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 40 and its dependent claims should not be sustained.

Claim 42:

Claim 42 recites:

> A system for operating a light engine configured to generate and display an image on a viewing surface, said image formed by pixels having varying gray scale levels, said system comprising:
>
> means for generating an estimate of an ambient light intensity level; and
>
> *means for selecting between a half-toning means and a dithering means* to generate said gray scale levels for each of said pixels in response to said estimated ambient light level.

(Emphasis added).

In this regard, the Office Action cites to Cruz at col. 3, lines 45-55, col. 4, lines 1-35, col. 5, lines 20-40, col. 6, lines 40-57 and col. 12, lines 39-51. (Action, p. 18). As before, the

Action unhelpfully provides absolutely no explanation as to the relevance of any of these cited portions of Cruz. Nevertheless, Applicant has reviewed these portions of Cruz, reproduced above, but finds that Cruz, as cited, does not appear to teach a system that includes "means for selecting between a half-toning means and a dithering means to generate" gray scale levels for individual pixels in response to estimated ambient light level. In fact, the Office Action fails to indicate how or where Cruz even mentions half-toning.

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987). See M.P.E.P. § 2131. Therefore, for at least the reasons explained here, the rejection based on Cruz of claim 42 and its dependent claims should not be sustained.

Claim 3:

Claim 3 recites:

> wherein said step of generating said apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region comprises:
> spatially and temporally dithering pixel blocks during a number of frame periods, each of said pixel blocks comprising a plurality of said pixels to be displayed in said pixel locations in said gradual shading region;
> wherein said spatial and temporal dithering of said pixel blocks generates an apparent gray scale level for each of said pixel blocks.

As demonstrated above in connection with claim 1, the final Office Action has failed to identify any teachings in Cruz of a "gradual shading region" or the method of claim 3 including dithering pixel blocks in a gradual shading region. For at least these additional reasons, the rejection of claim 3 should not be sustained.

Claim 11:

Claim 11 recites: "wherein said step of dithering said pixels comprises spatially and temporally dithering pixel blocks during said time period, each of said pixel blocks comprising a plurality of said pixels to be displayed in said group of pixel locations." In contrast, the final Office Action fails to accurately identify how or where Cruz teaches dithering pixels blocks *both* "spatially and temporally." The final Office Action does not address the distinction between pixels and pixel blocks and does not address dithering pixel *blocks* both spatially and temporally. For at least these additional reasons, the rejection of claim 11 should not be sustained.

Claim 14:

Claim 14 recites: "selecting a threshold gray scale level, wherein said dithering is selected to generate said gray scale levels for each of said pixels that is to have a gray scale level at or below said threshold gray scale level if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level." In contrast, the final Office Action fails to accurately identify how or where Cruz teaches or suggests this subject matter. The cited portions of Cruz (Action, p. 6) do not actually teach or suggest "selecting a threshold gray scale level, wherein said dithering is selected to generate said gray scale levels for each of said pixels that is to have a gray scale level at or below said threshold gray scale level if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level." For at least these additional reasons, the rejection of claim 14 should not be sustained.

Claim 29:

Claim 29 recites "wherein said dithering algorithm is selected to generate said gray scale levels for each of said pixels that is to have a gray scale level at or below a predetermined threshold gray scale level if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level." As above, the cited portions of Cruz (Action, p. 11) do not actually teach or suggest this subject matter. For at least these additional reasons, the rejection of claim 29 should not be sustained.

35 U.S.C. § 103:

Applicant wishes to here note that Cruz would not be valid prior art against the present application under 35 U.S.C. § 103(a) because of the provisions of 35 U.S.C. § 103(c). Specifically, Applicant hereby states that the subject matter of the present application and the Cruz reference were, at the time the invention of the present application was made, owned by, or subject to an obligation of assignment to, the same person, i.e., Hewlett-Packard Development Co. LP (*See* MPEP § 706.02(l)(2)). Therefore, no rejection of any claim of the present application should be made under 35 U.S.C. § 103 in reliance on the Cruz reference.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Rejection of September 9, 2008 and of May 14, 2009 is respectfully requested.

Respectfully submitted,

DATE: July 8, 2009

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VIII. CLAIMS APPENDIX

1. A method of reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said method comprising:

measuring an intensity of said ambient light;

comparing said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region; and

generating apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison.

2. The method of claim 1, further comprising:

selecting a dithering algorithm based on said comparison;

wherein said step of generating said apparent gray scale levels uses said dithering algorithm to generate said apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region.

3. The method of claim 1, wherein said step of generating said apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region comprises:

spatially and temporally dithering pixel blocks during a number of frame periods, each of said pixel blocks comprising a plurality of said pixels to be displayed in said pixel locations in said gradual shading region;

wherein said spatial and temporal dithering of said pixel blocks generates an apparent gray scale level for each of said pixel blocks.

4. The method of claim 3, wherein, during each of said number of frame periods, said step of spatially and temporally dithering said pixels comprises activating one or more of said plurality of pixel locations in each of said pixel blocks.

5. The method of claim 3, wherein said pixel blocks each comprise four pixels.

6. The method of claim 3, wherein said number of frame periods is equal to two.

7. A method of operating a light engine configured to project light onto a group of pixel locations of a viewing surface during a time period, said method comprising:

estimating an ambient light energy received by said group of pixel locations during said time period;

determining a threshold gray scale level of the light engine; and

dithering pixels having gray scale levels at or below said threshold gray scale level to be displayed in said group of pixel locations if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level.

8. The method of claim 7, further comprising measuring an ambient light intensity, wherein said step of estimating said ambient light energy is based on said measured ambient light intensity.

9. The method of claim 7 wherein said time period is one or more frame periods.

10. The method of claim 7, wherein said time period is a portion of a frame period.

11. The method of claim 7, wherein said step of dithering said pixels comprises spatially and temporally dithering pixel blocks during said time period, each of said pixel blocks comprising a plurality of said pixels to be displayed in said group of pixel locations.

12. A method of operating a light engine configured to generate and display an image on a viewing surface, said image formed by pixels having varying gray scale levels, said method comprising:

generating an estimate of an ambient light intensity level; and

selecting between half-toning and dithering to generate said gray scale levels for each of said pixels in response to said estimated ambient light level.

13. The method of claim 12, wherein said step of generating said estimate of said ambient light intensity level comprises measuring said ambient light intensity level with an ambient light sensor and transferring said measured ambient light intensity level to said light engine.

14. The method of claim 12, further comprising selecting a threshold gray scale level, wherein said dithering is selected to generate said gray scale levels for each of said pixels that is to have a gray scale level at or below said threshold gray scale level if said

estimated ambient light energy is greater than or substantially equal to said threshold gray scale level.

15. The method of claim 14, wherein said half-toning is selected to generate said gray scale levels for each of said pixels if said estimated ambient light energy is less than said threshold gray scale level.

16. The method of claim 14, wherein said dithering comprises spatially and temporally dithering pixel blocks during a number of frame periods, each of said pixel blocks comprising a plurality of said pixels.

17. A system for reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said system comprising:

an ambient light sensor configured to measure an intensity of said ambient light;

an image processing unit configured to compare said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region; and

a spatial light modulator configured to generate apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison.

18. The system of claim 17, wherein said image processing unit is further configured to select a dithering algorithm based on said comparison and said spatial light

modulator is further configured to use said dithering algorithm to generate said apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region.

19. The system of claim 17, wherein said spatial light modulator is configured to generate apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region by spatially and temporally dithering pixel blocks during a number of frame periods, each of said pixel blocks comprising a plurality of said pixels to be displayed in said pixel locations.

20. The system of claim 19, wherein said pixel blocks each comprise four pixels .

21. The system of claim 19, wherein said number of frame periods is equal to two.

22. The system of claim 17, wherein said spatial light modulator is selected from the group consisting of an analog based light modulator, a pulse-width modulation based light modulator, a liquid crystal display (LCD) panel, a liquid crystal on silicon (LCOS) device, a diffractive light device (DLD), and an array of micromirrors.

23. A light engine for displaying an image having a gradual shading region on a contrast enhancing screen, said light engine comprising:

a spatial light modulator configured to generate gray scale levels for pixels in said image;

projector optics configured to project light comprising said image onto said contrast enhancing screen, said projected light having an intensity; and

an ambient light sensor configured to measure an intensity of ambient light reflecting off pixel locations in said contrast enhancing screen corresponding to said gradual shading region;

wherein said spatial light modulator reduces a gray scale discontinuity caused by said ambient light between pixel locations in a blackened state on said contrast enhancing screen and said pixel locations in said gradual shading region by generating apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region based on a comparison between said measured ambient light intensity and said projected light intensity.

24. The system of claim 23, wherein said light engine further comprises:

an image processing unit configured to select a dithering algorithm based on said comparison;

wherein said spatial light modulator is further configured to use said dithering algorithm to generate said gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region.

25. The system of claim 24, wherein said dithering algorithm comprises spatially and temporally dithering pixel blocks during a number of frame periods, each of said pixel blocks comprising a plurality of said pixels to be displayed in said pixel locations in said gradual shading region.

26. The system of claim 25, wherein said number of frame periods is equal to two.

27. The system of claim 24, wherein said spatial light modulator is selected from the group consisting of an analog based light modulator, a pulse-width modulation based light modulator, a liquid crystal display (LCD) panel, a liquid crystal on silicon (LCOS) device, a diffractive light device (DLD), and an array of micromirrors.

28. A projector system for displaying an image on a viewing surface, said system comprising:

a light engine configured to generate pixels having gray scale levels to be displayed in corresponding pixel locations on said viewing surface; and

an ambient light sensor configured to measure an intensity of ambient light reflecting off said pixel locations on said viewing surface;

wherein said light engine is further configured to receive said measured ambient light intensity from said ambient light sensor and select between a half-toning algorithm and a dithering algorithm to generate said gray scale levels for each of said pixels based on said measured ambient light intensity.

29. The system of claim 28, wherein said dithering algorithm is selected to generate said gray scale levels for each of said pixels that is to have a gray scale level at or below a predetermined threshold gray scale level if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level.

30. The system of claim 29, wherein said half-toning algorithm is selected to generate said gray scale levels for each of said pixels if said estimated ambient light energy is less than said threshold gray scale level.

31. The system of claim 28, wherein said dithering algorithm comprises spatially and temporally dithering pixel blocks during a number of frame periods, each of said pixel blocks comprising a plurality of said pixels to be displayed in said pixel locations in said gradual shading region.

32. The system of claim 31, wherein said number of frame periods is equal to two.

33. The system of claim 28, wherein said light engine comprises a spatial light modulator configured to generate said gray scale levels of said pixels.

34. The system of claim 33, wherein said spatial light modulator is selected from the group consisting of an analog based light modulator, a pulse-width modulation based light modulator, a liquid crystal display (LCD) panel, a liquid crystal on silicon (LCOS) device, a diffractive light device (DLD), and an array of micromirrors.

35. The system of claim 28, wherein said viewing surface comprises a contrast enhancing screen.

36. A system for reducing a gray scale discontinuity between pixel locations in a blackened state on a contrast enhancing screen and pixel locations in a gradual shading region

of an image displayed by a projector on said contrast enhancing screen, said discontinuity caused by ambient light, said system comprising:

means for measuring an intensity of said ambient light;

means for comparing said measured ambient light intensity to an average intensity of light projected by said projector onto said gradual shading region; and

means for generating apparent gray scale levels for pixels to be displayed in said pixel locations in said gradual shading region based on said comparison.

37. The system of claim 36, further comprising:

means for selecting a dithering algorithm based on said comparison;

wherein said means for generating said apparent gray scale levels uses said dithering algorithm to generate said apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region.

38. The system of claim 36, wherein said means for generating said apparent gray scale levels for said pixels to be displayed in said pixel locations in said gradual shading region comprises:

means for spatially and temporally dithering pixel blocks during a number of frame periods, each of said pixel blocks comprising a plurality of said pixels to be displayed in said pixel locations in said gradual shading region;

wherein said means for spatial and temporal dithering of said pixel blocks generates an apparent gray scale level for each of said pixel blocks.

39. The system of claim 38, wherein, during each of said number of frame periods, said means for spatially and temporally dithering said pixels comprises means for activating one or more of said plurality of pixel locations in each of said pixel blocks.

40. A system for operating a light engine configured to project light onto a group of pixel locations of a viewing surface during a time period, said system comprising:

means for estimating an ambient light energy received by said group of pixel locations during said time period;

means for determining a threshold gray scale level of said light engine; and

means for dithering pixels having gray scale levels at or below said threshold gray scale level to be displayed in said group of pixel locations if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level.

41. The system of claim 40, further comprising means for measuring an ambient light intensity, wherein said means for estimating said ambient light energy is based on said measured ambient light intensity.

42. A system for operating a light engine configured to generate and display an image on a viewing surface, said image formed by pixels having varying gray scale levels, said system comprising:

means for generating an estimate of an ambient light intensity level; and

means for selecting between a half-toning means and a dithering means to generate said gray scale levels for each of said pixels in response to said estimated ambient light level.

43. The system of claim 42, wherein said means for generating said estimate of said ambient light intensity level comprises means for measuring said ambient light intensity level.

44. The system of claim 42, further comprising means for selecting a threshold gray scale level, wherein said dithering means is selected to generate said gray scale levels for each of said pixels that is to have a gray scale level at or below said threshold gray scale level if said estimated ambient light energy is greater than or substantially equal to said threshold gray scale level.

45. The system of claim 44, wherein said half-toning means is selected to generate said gray scale levels for each of said pixels if said estimated ambient light energy is less than said threshold gray scale level.

46. The system of claim 44, wherein said dithering means comprises spatially and temporally dithering pixel blocks during a number of frame periods, each of said pixel blocks comprising a plurality of said pixels.

IX. Evidence Appendix

None

X. Related Proceedings Appendix

None